MATHEMATICS STANDARD ARTICULATED BY GRADE LEVEL

GRADE 5

Strand 1: Number Sense and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Make models that represent improper fractions.

PO 2. Identify symbols, words, or models that represent improper fractions.

PO 3. Use improper fractions in contextual situations.

PO 4. Compare two proper fractions or improper fractions with like denominators.

PO 5. Order three or more unit fractions, proper or improper fractions with like denominators, or mixed numbers with like denominators.

PO 6. Compare two whole numbers, fractions, and decimals (e.g., 1/2 to 0.6).

PO 7. Order whole numbers, fractions, and decimals.

PO 8. Determine the equivalency between and among fractions, decimals, and percents in contextual situations.

PO 9. Identify all whole number factors and pairs of factors for a number.

PO 10. Recognize that 1 is neither a prime nor a composite number.

PO 11. Sort whole numbers (through 50) into sets containing only prime numbers or only composite numbers.

Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

PO 1. Select the grade-level appropriate operation to solve word problems.

PO 2. Solve word problems using grade-level appropriate operations and numbers.

PO 3. Multiply whole numbers.

PO 4. Divide with whole numbers.

PO 5. Demonstrate the distributive property of multiplication over addition.

PO 6. Demonstrate the addition and multiplication properties of equality.

PO 7. Apply grade-level appropriate properties to assist in computation.

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PO 8. Apply the symbol "[ ]" to represent grouping.

PO 9. Use grade-level appropriate mathematical terminology.

PO 10. Simplify fractions to lowest terms.

PO 11. Add or subtract proper fractions and mixed numbers with like denominators with regrouping.

PO 12. Add or subtract decimals.

PO 13. Multiply decimals.

PO 14. Divide decimals.

PO 15. Simplify numerical expressions using the order of operations with grade- appropriate operations on number sets.

Concept 3: Estimation

Use estimation strategies reasonably and fluently.

PO 1. Solve grade-level appropriate problems using estimation.

PO 2. Use estimation to verify the reasonableness of a calculation (e.g., Is 4.1 x 2.7 about 12?).

PO 3. Round to estimate quantities.

PO 4. Estimate and measure for area and perimeter.

PO 5. Compare estimated measurements between U.S. customary and metric systems (e.g., A yard is about a meter.).

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Strand 2: Data Analysis, Probability, and Discrete Mathematics

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Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.

PO 2. Construct a double-bar graph, line plot, frequency table, or three-set Venn diagram with appropriate labels and title from organized data.

PO 3. Interpret graphical representations and data displays including bar graphs (including double-bar), circle graphs, frequency tables, three-set Venn diagrams, and line graphs that display continuous data.

PO 4. Answer questions based on graphical representations, and data displays including bar graphs (including double-bar), circle graphs, frequency tables, three-set Venn diagrams, and line graphs that display continuous data.

PO 5. Identify the mode(s) and mean (average) of given data.

PO 6. Formulate reasonable predictions from a given set of data.

PO 7. Compare two sets of data related to the same investigation.

PO 8. Solve contextual problems using graphs, charts, and tables.

Concept 2: Probability

Understand and apply the basic concepts of probability.

PO 1. Name the possible outcomes for a probability experiment.

PO 2. Describe the probability of events as being:
- certain (represented by “1”),
- impossible, (represented by “0”), or
- neither certain nor impossible (represented by a fraction less than 1).

PO 3. Predict the outcome of a grade-level appropriate probability experiment.

PO 4. Record the data from performing a grade-level appropriate probability experiment.

PO 5. Compare the outcome of an experiment to predictions made prior to performing the experiment.

PO 6. Make predictions from the results of student-generated experiments using objects (e.g., coins, spinners, number cubes).

PO 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment.

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Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.
PO 1. Find all possible combinations when one item is selected from each of two sets of different items, using a systematic approach. (e.g., shirts: tee shirt, tank top, sweatshirt; pants: shorts, jeans).

Concept 4: Vertex-Edge Graphs
Understand and apply vertex-edge graphs.
PO 1. Color maps with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).

Strand 3: Patterns, Algebra, and Functions

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Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.
PO 1. Communicate a grade-level appropriate iterative pattern, using symbols or numbers.
PO 2. Extend a grade-level appropriate iterative pattern.
PO 3. Solve grade-level appropriate iterative pattern problems.

Concept 2: Functions and Relationships
Describe and model functions and their relationships.
PO 1. Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model).

Concept 3: Algebraic Representations
Represent and analyze mathematical situations and structures using algebraic representations.
PO 1. Evaluate expressions involving the four basic operations by substituting given decimals for the variable.
PO 2. Use variables in contextual situations.
PO 3. Solve one-step equations with one variable represented by a letter or symbol (e.g., $15 = 45 \div n$).

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Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.
PO 1. Describe patterns of change: • constant rate (speed of movement of the hands on a clock), and • increasing or decreasing rate (rate of plant growth).

Strand 4: Geometry and Measurement

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Concept 1: Geometric Properties
Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.
PO 1. Recognize regular polygons.
PO 2. Draw 2-dimensional figures by applying significant properties of each (e.g., Draw a quadrilateral with two sets of parallel sides and four right angles.).
PO 3. Sketch prisms, pyramids, cones, and cylinders.
PO 4. Identify the properties of 2- and 3-dimensional geometric figures using appropriate terminology and vocabulary.
PO 5. Draw points, lines, line segments, rays, and angles with appropriate labels.
PO 6. Recognize that all pairs of vertical angles are congruent.
PO 7. Classify triangles as scalene, isosceles, or equilateral.
PO 8. Recognize that a circle is a 360º rotation about a point.
PO 9. Identify the diameter, radius, and circumference of a circle.
PO 10. Understand that the sum of the angles of a triangle is 180°.
PO 11. Draw two congruent geometric figures.
PO 12. Draw two similar geometric figures.
PO 13. Identify the lines of symmetry in a 2-dimensional shape.

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Concept 2: Transformation of Shapes

Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1. Demonstrate reflections using geometric figures.

PO 2. Describe the transformations that created a tessellation.

Concept 3: Coordinate Geometry

Specify and describe spatial relationships using coordinate geometry and other representational systems.

PO 1. Graph points in the first quadrant on a grid using ordered pairs.

Concept 4: Measurement - Units of Measure - Geometric Objects

Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

PO 1. State an appropriate measure of accuracy for a contextual situation (e.g., What unit of measurement would you use to measure the top of your desk?).

PO 2. Draw 2-dimensional figures to specifications using the appropriate tools (e.g., Draw a circle with a 2-inch radius.).

PO 3. Determine relationships including volume (e.g., pints and quarts, milliliters and liters).

PO 4. Convert measurement units to equivalent units within a given system (U.S. customary and metric) (e.g., 12 inches = 1 foot; 10 decimeters = 1 meter).

PO 5. Solve problems involving the perimeter of convex polygons.

PO 6. Determine the area of figures composed of two or more rectangles on a grid.

PO 7. Solve problems involving the area of simple polygons.

PO 8. Describe the change in perimeter or area when one attribute (length, width) of a rectangle is altered.

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Strand 5: Structure and Logic

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Concept 1: Algorithms and Algorithmic Thinking Use reasoning to solve mathematical problems in contextual situations.
PO 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem.
PO 2. Design simple algorithms using whole numbers.
PO 3. Develop an algorithm or formula to calculate areas of simple polygons.

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.
PO 1. Construct *if…then* statements.
PO 2. Identify simple valid arguments using *if* … *then* statements based on graphic organizers (e.g., 3-set Venn diagrams and pictures).